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Memorandum

To: Paul Roberti, Esq. and Michael Rubin, Esq.

From: David Schlissel

Date: October 1, 2002

Subject: ***The impact of modifying the Brayton Point Station's Cooling System on Electric System Reliability***

We conducted an independent assessment to examine the reasonableness of the EPA's conclusion that conversion of the Brayton Point Station to a closed cycle water cooling system would not adversely affect electric system reliability.

Short-Term Generating Unit Outages

The EPA concluded that short-term generating outages would be needed to complete the conversion of the Brayton Point Units to close cycle cooling systems. The EPA estimated that these outages could extend approximately three months beyond the regularly scheduled one month annual maintenance outages for each unit.[1] These estimates appear reasonable based on the engineering analyses performed for the EPA.

The EPA further estimated that these short-term outages would occur for one unit at a time and the EPA and Massachusetts DEP would expect to work with the units' owners to schedule construction so that any necessary outages would avoid peak electricity demand periods.[2] Again, these appear to be reasonable assumptions. However, we also note that NEPOOL Operating Procedure No. 5 prevents plant owners from taking generating units out of service for maintenance without approval of the Independent System Operator, unless there is a danger to personnel or a risk of equipment damage.[3] The same Operating Procedure also establishes that plant owners must request, and the Independent System Operator must evaluate and approve or deny generator unit outage

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1 *EPA – New England Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA (NPDES Permit No. MA 0003654*, July 22, 2002, at page 7-180.

2 Ibid.

3 *NEPOOL Operating Procedure No. 5, Generation Maintenance and Outage Scheduling*, approved on July 12, 2000.

requests, taking consideration of the impact of the proposed outage on system reliability. As a result, outages to retrofit the plants affected by the proposed regulations could be carefully planned to occur during off-peak periods and could be coordinated with routine scheduled maintenance outages in order to minimize the total amount of time each unit is unavailable for service.

In fact, through modeling analysis of the NEPOOL system, ISO-NE has found that increasing power plant scheduled outages dramatically (by about a factor of four from the annual maintenance schedule figures projected for 2000 and 2001) "showed virtually no impact on reliability."[4] The nearly four-fold increase in assumed scheduled outages resulted in an increase in "objective capability" (the amount of generating capacity required to meet reliability goals) by only 50 MW. The report by ISO-NE explained that "this is because the profile of New England electrical demand is so strongly summer peaking that the amount of maintenance in the fall, winter, and spring periods is not a significant factor in setting Objective Capability."

At the same time, we examined what impact these generating unit outages would have if, by some unforeseeable circumstance, they did extend until the peak summer and winter demand periods. Table 1 below shows that New England would continue to have thousands of megawatts of reserve capacity even if one of the Brayton Point Station's units were shut down for conversion of its cooling system each summer peak demand period between 2004 and 2007.

Table 1: Impact of Sequential Brayton Point Generating Unit Outages During Summer Peak Periods

	2004	2005	2006	2007
Total New England Capacity (MW)	34399	35195	35093	35060
Capacity of Brayton Point Unit Shutdown for Cooling System Conversion (MW)	244	240	612	435
New England Capacity Without 1 Brayton Point Unit (MW)	34155	34955	34481	34625
New England Loads (MW)	25221	25542	25916	26258
New England Installed Capacity Reserves (MW)	8934	9413	8565	8367
New England Installed Capacity Reserves (%)	35	37	33	32

Consequently, New England would continue to have more than adequate electric system capacity reserves in the unlikely situation where one of the outages of the Brayton Point

[4] *Review of NEPOOL Objective Capability for Power Year 2000-2001*, prepared for NEPOOL by ISO-NE, at page 29.

Station units extended into a summer peak period. New England would even have more than adequate system capacity reserves if more than two or more of the units at the Brayton Point Station were shutdown at the same time for cooling system conversions at the same time during a peak summer season.

Table 2: Impact of Two Simultaneous Brayton Point Generating Unit Outages During Summer Peak Periods

	2004	2005	2006	2007
Total New England Capacity (MW)	34399	35195	35093	35060
Capacity of Brayton Point Units 1 and 3 Shutdown for Cooling System Conversion (MW)	856	856	856	856
New England Capacity Without 2 Brayton Point Units (MW)	33543	34339	34237	34204
New England Loads (MW)	25221	25542	25916	26258
New England Installed Capacity Reserves (MW)	8322	8797	8321	7946
New England Installed Capacity Reserves (%)	33	34	32	30

Table 2 assumes that Brayton Point Station Units 1 and 2 are out of service at the same time for cooling system conversions. But the conclusion that the New England electric system would have adequate capacity to meet expected customer demands while providing reasonable reserves would be the same even if the two largest Units at Brayton Point (i.e., Units 3 and 4 with a combined capacity of 1,057 MW) were shut down at the same time.

The New England electric system also would have more than adequate capacity reserve margins if the Brayton Point Station units were shut down for cooling system conversions at the time of the peak winter demands.

Table 3: Impact of Sequential Brayton Point Generating Unit Outages During Winter Peak Periods

	2003/04	2004/05	2005/06	2006/07
Total New England Capacity (MW)	37033	37758	37612	37595
Capacity of Brayton Point Unit Shutdown for Cooling System Conversion (MW)	255	255	633	446
New England Capacity Without 1 Brayton Point Unit (MW)	36778	37503	36979	37149
New England Loads (MW)	22127	22396	22715	22992
New England Installed Capacity Reserves (MW)	14651	15107	14264	14157
New England Installed Capacity Reserves (%)	66	67	63	62

Because system loads are lower during the spring and fall months, electric system capacity reserves and reserve margins are higher during these off-peak months. In fact, New England can be expected to have more than 10,000 MW of capacity reserve during these spring and fall periods. These capacity reserves would allow for the units at the Brayton Point Station to be taken off line in a planned schedule to complete the conversion to closed cycle cooling systems.

Long-term Efficiency Losses

The Brayton Point Station can be expected to experience efficiency penalties as a result of the retrofitting of cooling towers under the closed cycle option. The efficiency losses estimated by PG&E and the EPA are listed on Table 4.4-3 on page 4-76 of the EPA's July 22, 2002 *New England Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA (NPDES Permit No. MA 0003654).*

However, the change to a closed cycle cooling system also would lead to gains in output from the Brayton Point Station during the peak demand hot weather periods.[5] The output from the units at Brayton Point would not have to be curtailed during certain hot ambient

[5] *New England Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA (NPDES Permit No. MA 0003654),* at page 4-77.

water conditions during the summer season as it has been with the once-through cooling system.[6]

At worse, these effects would offset so that the retrofitting of cooling towers would not have an adverse effect on the power that would be available from Brayton Point to meet electric system demands. At best, the output from the Brayton Point units might be marginally higher once the conversion to the closed cycle cooling system is completed.

But the impact of the efficiency losses on electric system reliability still would be extremely minor even if there were no offsetting gains from increased generation during certain hot weather conditions. Abt Associates has estimated that the effective capacity loss of the conversion to a closed cycle system would be about 25 MW.[7] Such a small capacity loss would have no real impact on electric system reliability given the large capacity reserves that are expected in New England during the next ten years.[8]

The loss of this minor amount of capacity also would not have a significant effect on electric system reliability in the Southeastern Massachusetts/Rhode Island sub-area of New England. It is expected that this sub-area will have an excess of generating capacity because of limits on the amounts of power that can be transmitted to the rest of New England over existing and planned lines. In fact, the Independent System Operator of New England is concerned that the Southeastern Massachusetts/Rhode Island sub-area will have "significant amounts of locked in generation beginning in 2002 due to the lack of adequate transmission capability."[9]

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6 *Cost Analysis of Alternative Technology Options for Management of Thermal Discharge and Cooling Water Intake for Brayton Point Station,* Abt Associates, Inc., April 5, 2002, at page 7.

7 Abt Environmental Research Memorandum on *Social Cost Analysis of Closed Cycle System Installation at Brayton Point Station*, May 9, 2002, at page 4.

8 April 1, 2002, *NEPOOL Forecast of Capacity, Energy, Loads and Transmission – 2002-2011*, at pages 1 and 2.

9 ISO-NE *2001 Regional Transmission Expansion Plan (RTEP01),* October 19, 2001, at page 11.